Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] 1. An apparatus for controlling the ratio of the amount of fuel and the amount of air in a natural gas fueled internal-combustion engine intended to work in a specified engine-specific load-rotation speed diagram, said apparatus comprising:
a throttle (8) for controlling the amount of air supplied to combustion chambers in the internal-combustion engine;
injection devices for controlling the amount of natural gas supplied to the combustion chambers;
control devices (21) for controlling the throttle and the injection devices, whereby the control device (21) is arranged to control the ratio of the amount of fuel and the amount of air dependent on the current operating point in the internal-combustion engine load-rotation speed diagram wherein the load-rotation speed diagram is divided into a first area where the internal-combustion engine operates in lean mode and a second area where the internal-combustion engine operates in stochiometric or rich mode and by that the area for stochiometric operation is arranged to be used for operating points in the load-rotation speed area with low power.

[c2] 2. The apparatus as recited in claim 1, wherein the stochiometric operation area is separated from the lean operation area so that the temperature at a position downstream of the combustion chamber exhaust ports of the internal-combustion engine is limited to a maximum allowed temperature at which the control device (21) is arranged to allow change from stochiometric or rich operation to lean operation before the maximum temperature is reached.

[c3] 3. The apparatus as recited in claim 1, wherein the control device (21) is arranged to determine the current operating point in the load-rotation speed diagram using a control signal corresponding to the required developed torque from the internal-combustion engine.

[c4] 4. The apparatus as recited in claim 1, wherein the control device (21) is arranged to control the change between lean operation and stochiometric or rich operation on passage from the first area to the second area by step by step adjustment of the ratio of the amount of fuel and the amount of air.

[c5] 5. The apparatus as recited in claim 1, wherein the control device (21) is arranged to control the change between stochiometric or rich operation and lean operation

on passage from the second area to the first area by step by step adjustment of the ratio of the amount of fuel and the amount of air.

[c6] 6. The apparatus as recited in claim 1, wherein the first area and the second area partly overlap each other thereby hindering unstable commutation between the areas.

[c7] 7. The apparatus as recited in claim 1, wherein the first area corresponds to a λ value between 1.25 and 1.6 and that the second area corresponds to a λ value between 0.7 and 1.0.

[c8] 8. A method for controlling the ratio of the amount of fuel and the amount of air in a natural gas fueled internal-combustion engine intended to work in a specified engine-specific load-rotation speed diagram, said method comprising:
utilizing a control device (21) and controlling the internal-combustion engine so that the ratio of the amount of fuel to the amount of air is dependent on the current operating point in the internal-combustion engine load-rotation speed diagram by adjusting the throttle angle of a throttle (8) in the internal-combustion engine for controlling the amount of air supplied to the combustion chambers in the internal-combustion engine and con-

trolling the amount of natural gas supplied to the combustion chambers via injection devices; and
operating the internal-combustion engine in stochiometric or rich mode at operation points in the load-rotation rate diagram with low power and in lean mode at operation points in the load-rotation speed diagram with high power.

[c9] 9. The method as recited in claim 8, wherein the area of stochiometric or rich operation is separated from the area of lean operation so that the temperature at a position downstream of the combustion chamber exhaust ports of the internal-combustion engine is limited to a maximum allowed temperature at which the control device (21) is arranged to allow change from stochiometric or rich operation to lean operation before the maximum temperature is reached.

[c10] 10. The method as recited in claim 8, wherein the control device (21) is utilized to determine the current operating point in the load-rotation speed diagram using a control signal corresponding to the required torque from the internal-combustion engine.

[c11] 11. The method as recited in claim 8, wherein the control device (21) controls the change between lean operation and stochiometric operation on passage from the

first area to the second area through step by step adjustment of the ratio of the amount of fuel and the amount of air.

[c12] 12. The method as recited in claim 11, wherein the control device (21) controls the change between stochiometric operation and lean operation on passage from the second area to the first area through step by step adjustment of the ratio of the amount of fuel and the amount of air.

[c13] 13. The method as recited in claim 8, wherein the first area and the second area partly overlap each other thereby hindering unstable commutation between the areas.

[c14] 14. The method as recited in claim 8, wherein the first area corresponds to a λ value between 1.25 and 1.6 and that the second area corresponds to a λ value between 0.7 and 1.0.